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LOCALIZED CHAOTIC SCATTERING IN THE EARTH'S MAGNETOTAIL

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We investigate the Hamiltonian system of a charged particle in the modified Harris magnetic field model, relevant to the plasma dynamics in the current sheet in the earth's magnetotail. For some initial conditions, the motion of the particle is chaotic and exhibits "*the sensitive dependence on the initial condition*": a minute difference in the initial condition results in a drastically different behavior for the particle after a long time. This is also a scattering system as the particle stays in the current sheet or scattering region for a finite time interval before it escapes from the region.

We are interested in the statistical properties of an ensemble of particle trajectories that share the same value for the particle energy. The behavior of the ensemble has been shown to critically depend on the particle energy. For example, at the values called "*the resonant energies*," the particle on a chaotic trajectory tends to stay in the current sheet region much longer than the particle on a chaotic trajectory with energy away from the resonant energies.

Our numerical results show that the average Lyapunov exponent, which characterizes the sensitivity of the particle trajectory to its initial condition, increases for higher resonant energies whereas away from the resonant energies it remains relatively small. In the talk, we will show that the distribution of the Lyapunov exponents follows a universal functional form at both the resonant and the off-resonant energies.